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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)
Shunpei YAMAZAKI et al.	)
Serial No. 09/126,826	) Group Art Unit: 2871
Filed: July 31, 1998	) Examiner: Nguyen, D
For: METHOD FOR PRODUCING	)
DISPLAY DEVICE	)

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VERIFICATION OF TRANSLATION

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Ikuko Noda, 3-G, 1551, Hase, Atsugi-shi, Kanagawa-ken 243-0036 Japan, a translator, herewith declare:

that I am well acquainted with both the Japanese and English Languages;

that I am the translator of the attached translation of the Japanese Patent Application No.7-86372 filed on March 18, 1995; and

that to the best of my knowledge and belief the following is a true and correct translation of the Japanese Patent Application No.7-86372 filed on March 18, 1995.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: this 29th day of April, 2000

Ikuko Noda

Name: Ikuko Noda

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[Filing Date]	March 18, 1995
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[Title of Invention]	DISPLAY DEVICE AND METHOD OF MANUFACTURING THE SAME
[Number of Claims]	8
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[Attachment]	Specification	1
[Attachment]	Drawing	1
[Attachment]	Abstract	1

[NAME OF DOCUMENT] Specification

[TITLE OF THE INVENTION] DISPLAY DEVICE AND METHOD OF MANUFACTURING THE SAME

[WHAT IS CLAIMED IS:]

1. A display device comprising:

an electrical wiring formed over a first substrate;

a semiconductor integrated circuit having a thin film transistor connected to the electrical wiring; and

a second substrate having a transparent conductive film on a surface thereof, said transparent conductive film is opposite to the electrical wiring of the transparent conductive film over the first substrate,

wherein the semiconductor integrated circuit has substantially a same length as one side of a display screen of the display device and is obtained by peeling it from another substrate and then forming it over the first substrate,

wherein a main part of the semiconductor integrated circuit is consisted with an island region covered with an insulating film and the periphery of the end portion of the island region has a taper shape.

2. A display device comprising:

a plurality of first electrical wirings of transparent conductive films extended to a first direction formed over a first substrate;

a first semiconductor integrated circuit having a thin film transistor connected to

the first electrical wirings and having island shape which is extended to a second direction substantially vertical to the first direction;

a plurality of second electrical wirings of transparent conductive films extended to a second direction formed over a second substrate; and

a second semiconductor integrated circuit having a thin film transistor connected to the second electrical wirings and having island shape which is extended to the first direction;

wherein the first and second substrates are arranged so that the first electrical wiring is opposite to the second electrical wirings,

wherein the first and second semiconductor integrated circuits are obtained by peeling them from another substrate and then forming them over the first and second substrates, respectively,

wherein the main part of the semiconductor integrated circuit is covered with an insulating film having a taper shape in the periphery of the end portion.

3. A display device comprising:

a plurality of first electrical wirings extended to a first direction formed over a first substrate;

a first semiconductor integrated circuit having a thin film transistor connected to the first electrical wirings and extended to a second direction substantially vertical to the first direction;

a plurality of second electrical wirings extended to a second direction formed over the first substrate;

a second semiconductor integrated circuit having a thin film transistor connected to the second electrical wirings and extended to the first direction; and

a second substrate having a transparent conductive film on a surface thereof;

wherein the first and second substrates are arranged so that the first and the second electrical wirings of the first substrate are opposite to the transparent conductive film of the second substrate,

wherein the first and second semiconductor integrated circuits are obtained by peeling them from another substrate and then forming them over the first substrate,

wherein a main part of the semiconductor integrated circuit is consisted with island region covered with an insulating film, said island region has a taper shape in the periphery of the end portion.

4. The display device according to the claims 1 to 3 wherein at least the first substrate comprises a plastic.

5. The display device according to the claims 1 to 3 wherein the second substrate is formed in the vertical direction of the semiconductor integrated circuit formed over the first substrate.

6. A method for producing a display device comprising the steps of:

forming an electrical wiring over a first substrate;

forming a main portion of the semiconductor integrated circuits having a thin film transistor over another substrate;

covering the main portion of the semiconductor integrated circuit with an insulating film;

forming an island region having a taper shape in the end portion by processing the insulating film;

forming over the second substrate a transparent conductive film which is opposite to the electrical wiring of the first substrate; and

peeling the semiconductor integrated circuit comprising the insulating film from the another substrate and forming it over the first substrate.

7. A method for producing a display device comprising the steps of:

forming over a first substrate a plurality of electrical wirings comprising transparent conductive films extended to a first direction;

forming a main portion of the semiconductor integrated circuits having a thin film transistor over another substrate;

covering the main portion of the semiconductor integrated circuit with an insulating film;

forming long and narrow island region having a taper shape in an end portion by processing the insulating film;

peeling the long and narrow island region from the another substrate;

forming over the first substrate in the direction extended to the second direction substantially vertical to the first direction;

providing over a second substrate a plurality of second electrical wirings of transparent conductive film extended to the second direction;

peeling the long and narrow island region from another substate to form it over the second substrate in the direction extended to the first direction; and

disposing the first and second substrates so that the first electrical wirings are opposite to the second electrical wirings.

8. A method for producing a display device comprising the steps of:

forming over a first substrate a plurality of first electrical wirings extended to a first direction;

forming over the first substrate a plurality of second electrical wirings extended to a second direction;

forming a main portion of the semiconductor integrated circuits each having a thin film transistor over another substrate;

covering a main portion of the semiconductor integrated circuit with an insulating film;

forming long and narrow island region having a taper shape in the periphery of the end portion by processing the insulating film;

peeling the long and narrow island region from the another substrate;

forming over the first substrate in the direction extended to the first direction to connect with the second electrical wirings;

peeling the long and narrow island region from the another substrate and forming over the first substrate in the direction extended to the second direction to connect with the first electrical wirings;

forming a transparent conductive film on the second substrate; and

disposing the first and second substrates so that the first and second electrical wirings of the first substrate are opposite to the transparent conductive film of the second substrate.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[FIELD OF INDUSTRIAL USE]

The present invention relates to a passive matrix type or an active matrix type display device such as a liquid crystal display device, in particular, a fashionable display device having a large occupying area of a display device on a substrate which is obtained by effectively forming a semiconductor integrated circuit for driving.

[0002]

[Description of the Prior Art]

Structures of a passive matrix type and an active matrix type have been known as

a matrix type display device. In the passive matrix type, a large number of strip type electrical wirings (row wirings) made of a transparent conductive film or the like are formed on a first substrate along one direction, and strip type electrical wirings (column wirings) are formed on a second substrate in a direction substantially perpendicular to the direction of the electrical wirings formed on the first substrate. These substrates are arranged so that the electrical wirings formed on both the substrates are opposite to one another.

[0003]

If an electro-optical material such as a liquid crystal material that a transparent (transmittance) degree and a photo reflective-scattering degree are changed by a voltage, a current or the like is formed between the substrates, the transparent degree, the photo reflective-scattering degree and the like in its intersection portion can be selected by applying (supplying) a voltage, a current or the like between a desired row wiring on the first substrate and a desired column wiring on the second substrate. Thus, a matrix display can be performed.

[0004]

In the active matrix type, row wirings and column wirings are formed on the first substrate using a multilayer wiring (interconnection) technique, pixel electrodes are formed in those intersection portions, and an active element such as a thin film transistor (TFT) is formed at each pixel electrode, so that a structure which controls a voltage (potential) or a current with respect to the pixel electrodes is obtained. Also, a transparent conductive film is formed on the second substrate. The first and second substrates are arranged so that the pixel electrodes on the first substrate are opposite to the transparent conductive film on the second substrate.

[0005]

A substrate to be used is selected in accordance with a producing process. In the passive matrix type, since a complex process is not performed except that a transparent conductive film is formed and then etched to form row and column wiring patterns, a glass substrate and a plastic substrate can be used. On the other hand, in the active matrix type, since a film formation process with relatively high temperature is performed and the prevention of an active ion such as sodium is required, it is necessary to use a glass substrate having an extremely low alkali concentration.

[0006]

[PROBLEM TO BE SOLVED BY THE INVENTION]

Thus, in a conventional matrix type display device, except for a special device, it is necessary to provide the display device with a semiconductor integrated circuit (a peripheral driver circuit or a bar circuit) for driving a matrix circuit. Such a circuit is mounted by using tape automated bonding (TAB) or chip on glass (COG). However, since it has a large scale matrix with, for example, about several hundred lines, the number of terminals in an integrated circuit is extremely large. Since a driver circuit is constructed by a rectangular-shaped integrated circuit (IC) package and a semiconductor chip, it is necessary to lead wirings in order to connect these terminals to electrical wirings on a substrate. Therefore, an area of peripheral portion cannot be neglected because this area is large relatively in comparison with a display screen. That is,

[0007]

To solve the problem, a method for forming a driver circuit on a long and narrow substrate (stick or stick crystal) having substantially the same length as a side of a matrix and then connecting the driver circuit to terminal portions of the matrix is disclosed in Japanese Patent Application Laid-Open No. 7-14880 by the present applicant. Since a width of about 2 mm is sufficient for the driver circuit, such arrangement is possible.

Thus, an area on the substrate can be almost used as a display screen.

[0008]

In this state, when a matrix circuit has a large area, since a circuit cannot be formed on a silicon wafer, it is necessary to form it on a glass substrate or the like. Thus, an active element disposed in the pixel electrode is a TFT.

[0009]

With respect to the stick crystal, however, a thickness of a substrate for a driver circuit suppresses miniaturization of the whole display device. It is possible that a thickness of a substrate is set to 0.3 mm in order to obtain a thinner display device, by optimizing a kind of a substrate and a process. From a strength required in a producing process, it is difficult to set a thickness of the stick crystal to 0.5 mm or less. As a result, when the stick crystal is mated with a substate, it protrude 0.2mm or more.

[0010]

When a kind of the stick crystal is different from that of the substrate of the display device, a defect may occur in a circuit by a difference of thermal expansion or the like. In particular, when a plastic substrate is used in the display device, this occurs remarkably. This is because that, it is substantially impossible from a view of heat resistance that plastic is used as a substrate of the stick crystal. Also, since the formed semiconductor integrated circuit is thick, wirings to be connected to the semiconductor integrated circuit is disconnected (broken) at a large step portion of end portions of the semiconductor integrated circuit or a wiring resistance becomes high, so that a product yield of the whole device and reliability are reduced. The object of the present inveniton is to obtain a smaller and light-weight display device by solving the problem of the stick crystal.

[0011]

[MEANS TO SOLVE THE PROBLEM]

In the present invention, only a semiconductor integrated circuit equivalent to the stick crystal is connected mechanically and electrically over a substrate of a display device to thin a driver circuit portion. In this state, it is characterized in that a cross section of the semiconductor integrated circuit portion becomes a taper shape that is widest in a connection portion to the display device and become narrow as it is apart therefrom. In such a structure, there is no vertical step and disconnection of an electrical wiring does not occur easily.

[0012]

A basic structure of a display device according to the present invention is as follows. That is, a first substrate includes electrical wirings and a long and narrow semiconductor integrated circuit comprising TFTs which is connected electrically to the electrical wirings, and a second substrate includes a transparent conductive film on a surface thereof. A surface of the first substrate that the electrical wirings are formed is opposite to the transparent conductive film on the second substrate. Thus, as the stick crystal disclosed in Japanese Patent Application Laid-Open No. 7-14880, the semiconductor integrated circuit has substantially the same length as one side of a display screen (i.e., a matrix circuit) of the display device and is obtained by peeling it from another substrate and then forming it on the first substrate.

[0013]

In particular, in the case of a passive matrix type, a first substrate includes first electrical wirings of a plurality of transparent conductive films extended to a first direction and a first long and narrow semiconductor integrated circuit having TFTs which is connected to the first electrical wirings and extended to a second direction substantially vertical to the first direction, and a second substrate includes second

electrical wirings of a plurality of transparent conductive films extended to the second direction and a second semiconductor integrated circuit having TFTs which is connected to the second electrical wirings and extended to the first direction. The first and second substrates are arranged so that the first electrical wirings are opposite to the second electrical wirings. The first and second semiconductor integrated circuits are obtained by peeling them from another substrate and then forming them on the first and second substrates.

[0014]

In the case of an active matrix type, a first substrate includes a first plurality of electrical wirings extended to a first direction and a first semiconductor integrated circuit having TFTs which is connected to the first electrical wirings and extended to a second direction substantially vertical to the first direction, a second plurality of electrical wirings extended to the second direction, and a second semiconductor integrated circuit having TFTs which is connected to the second electrical wirings and extended to the first direction, and a second substrate comprising a transparent conductive film on a surface thereof. The first and second substrates in the display device are arranged so that the first and second electrical wirings on the first substrate are opposite to the transparent conductive film on the second substrate. The first and second semiconductor integrated circuits are obtained by peeling them from another substrate and then forming them on the first substrate.

[0015]

A method for forming a semiconductor integrated circuit having TFTs on another substrate, peeling the formed circuit from the substrate and adhering the peeled circuit on another substrate (or removing the substrate after adhering the circuit on another substrate) has been known as a silicon on insulator (SOI) technique. The technique

disclosed in Japanese Patent Application Laid-Open No. 6-504139, another known technique or a technique used in an embodiment described below may be used.

[0016]

Fig. 1 shows an example of a cross section of a passive matrix type display device. Fig. 1(A) is a cross section obtained at a relatively low magnification. The left side of the figure shows a driver circuit portion 1 formed on a semiconductor integrated circuit, and the left shows a matrix portion 2. A semiconductor integrated circuit 6 having a taper-shaped cross section is fixed mechanically on a substrate 3 by a resin 5. A pattern of an electrical wiring 4 made of a transparent conductive film or the like is formed and at the same time an electrical connection is performed.

[0017]

Fig. 1(B) is obtained by magnifying a region enclosed by a dot line in Fig. 1(A). The same marks as Fig. 1(A) are used in Fig. 1(B). The semiconductor integrated circuit has a structure that an N-channel type TFT (7) and a P-channel type TFT (8) are disposed between a base insulating film 9 and an interlayer insulator 10 or a passivation film 11 of silicon oxide or the like. (Fig. 1(B))

[0018]

With respect to a contact portion of a semiconductor integrated circuit and a wiring electrode, a wiring may be patterned after the semiconductor integrated circuit is fixed on a substrate. As shown in Fig. 3A, a semiconductor integrated circuit 34 having a metal wiring 33 may be fixed on a substrate 40 having an electrical wiring 31 of a transparent conductive film or the like in advance and then electrical connection may be performed. Figs. 3(B) and 3(C) are magnification views of connection portions. The electrical connection is performed by a method for using an anisotropic conductive adhesive 32 in Fig. 3(B) or a method for crimping the metal wiring 33 in advance in a

bump 35 disposed on a wiring electrode 31 as shown in Fig. 3(C).

[0019]

A schematic order of processes for producing such a passive matrix type display device is shown in Fig. 2. Fig. 2 shows a producing procedure of a passive matrix type display device. First, a large number of semiconductor integrated circuits 22 are formed over a desired substrate 21. (Fig. 2(A))

[0020]

Then, this is divided to obtain stick crystals 23 and 24. Electrical characteristics in the obtained stick crystals are tested before performing next process, to select good products and defectives. (Fig. 2(B))

[0021]

Then, semiconductor integrated circuits 29 and 30 on the stick crystals 23 and 24 are adhered on surfaces 26 and 28 of another substrates 25 and 27 in which patterns of wirings made of a transparent conductive film are formed, by the SOI technique, and are connected electrically to the wirings. (Figs. 2(C) and 2(D))

[0022]

Finally, the obtained substrates are opposed to one another, so that a passive matrix type display device is obtained. A surface 26 is a reverse surface of the surface 26, i.e., a surface on which a wiring pattern is not formed. (Fig. 2(G))

[0023]

In the above case, a row stick crystal (a stick crystal for a driver circuit for driving a row wiring) and a column stick crystal (a stick crystal for a driver circuit for driving a column wiring) are divided from the same substrate 21. However, these stick crystals may be divided from another substrate. Although a passive matrix type display device is shown in Fig. 2, the same process may be performed for an active matrix type display

device. A case wherein a material such as a film is formed as a substrate is shown in an embodiment.

[0024]

[EMBODIMENT]

[Embodiment 1]

The embodiment shows a schematic producing process for one substrate in a passive matrix type liquid crystal display device. The present embodiment will be explained using Figs. 4 and 5. Fig. 4 shows a schematic process for forming a driver circuit on a stick crystal, and Fig. 5 shows a schematic process for mounting the driver circuit on a substrate in a liquid crystal display device.

[0025]

A silicon film 51 having a thickness of 3000 Å is deposited as a peeling layer on a glass substrate 50. Since this silicon film 51 is etched when a circuit formed thereon is peeled from the substrate, there is no problem almost with respect to a film quality, so that the silicon film may be deposited by a method that mass-production is possible. The silicon film may be amorphous or crystalline and include another element.

[0026]

As the glass substrate, a glass containing no alkali or alkali at a low concentration or a quartz glass such as Corning 7059, Corning 1737, NH technoglass NA 45, NH technoglass NA 35 or Japan electric glass OA2 may be used. When a quartz glass is used, there is a problem in its cost. However, since an area used in one liquid crystal display device is extremely small in the present invention, a cost per unit is sufficiently low.

[0027]

A silicon oxide film 53 having a thickness of 200 nm is deposited on the silicon

film 51. Since the silicon oxide film is used as a base film, it is necessary to pay sufficient attention to its formation. By a known method, crystalline island silicon regions (silicon islands) 54 and 55 are formed. The thickness of these silicon films influence characteristics of a necessary semiconductor circuit. In general, it is preferable to be a thin film. In the embodiment, the thickness is 40 to 60 nm.

[0028]

To obtain crystalline silicon, a method for irradiating an intense light such as a laser into an amorphous silicon (a laser annealing method) or a method for making a solid phase growth by thermal annealing (a solid phase growth method) is used. In using the solid phase growth method, as disclosed in Japanese Patent Application Laid-Open No. 6-244104, when a catalytic element such as nickel is added to silicon, a crystallization temperature can be reduced and an annealing time can be shortened. Also, as disclosed in Japanese Patent Application Laid-Open No. 6-318701, silicon crystallized by the solid phase growth method may be laser-annealed. A method to be used may be determined in accordance with characteristics of a necessary semiconductor integrated circuit, a heat-resistance temperature of a substrate and the like.

[0029]

By plasma chemical vapor deposition (plasma CVD) or thermal CVD, a silicon oxide having a thickness of 120 nm is deposited as a gate insulating film 56, and then gate electrode-wirings 57 and 58 using crystalline silicon having a thickness of 500 nm are formed. The gate wirings may be a metal such as aluminum, tungsten or titanium, or silicide thereof. When metal gate electrode-wirings are formed, as disclosed in Japanese Patent Application Laid-Open No. 5-267667 or 6-338612, an upper or a side surface of the gate electrode-wirings may be coated with an anodic oxide. A material constructing the gate electrode-wirings may be determined in accordance with characteristics of a

necessary semiconductor circuit, a heat-resistance temperature of a substrate and the like. (Fig. 4(A))

[0030]

In a self-alignment manner, an N-type and a P-type impurities are introduced into the silicon islands by ion doping or the like, to form N-type regions 59 and P-type regions 60. An interlayer insulator 61 (a silicon oxide film having a thickness of 500 nm) is deposited by a known method, and then contact holes are formed therein, to form aluminum alloy wirings 62 to 64. (Fig. 4(B))

[0031]

A polyimide film 70 is formed as a passivation film on those films by adding varnish and then curing it. In the embodiment, Photoneath UR-3800 of Toray Industries Inc. is used. First, addition is performed by a spinner. An addition condition may be determined in accordance with a desired film thickness. The polyimide film having a thickness of about 4μ m is formed at 3000 rpm for 30 seconds. After drying, exposure and development are performed. By selecting a desired condition, a desired taper shape can be obtained. The film is then cured by processing at 300 °C in an atmosphere containing nitrogen. (Fig. 4(C))

[0032]

Subsequently, a transfer substrate 72 is adhered to the semiconductor integrated circuit by a resin 71. It is desired that the transfer substrate has a strength and a flat surface to hold the integrated circuit impermanently. Thus, glass, plastic or the like can be used. Since the transfer substrate is peeled later, it is preferable that the resin 71 is a removable material. Also, as the resin 71, a material which is easy to peel off such as an adhesive may be used. (Fig. 5(A))

[0033]

The processed substrate is left within air flow of a mixture gas of fluorine trichloride (ClF_3) and nitrogen. A flow rate of fluorine trichloride and nitrogen is set to 500 sccm. A reaction process is 1 to 10 Torr. A temperature is a room temperature. It has been known that fluorine halide such as fluorine trichloride has a characteristic for selectively etching silicon. On the other hand, silicon oxide is not almost etched. Thus, the peeling layer is etched in accordance with an elapse. However, the base film 53 is not almost etched, so that a TFT element is not damaged. When further elapsing a time, the base layer 51 is etched completely, thereby to peel the semiconductor integrated circuit completely. (Fig. 5(B))

[0034]

The peeled semiconductor integrated circuit is adhered to a substrate 75 of a liquid crystal display device by a resin 76 and then the transfer substrate 72 is removed. (Fig. 5(C))

[0035]

Thus, a transfer of the semiconductor integrated circuit to the substrate of the display device is completed. The substrate of the liquid crystal display device is polyether sulfone (PES) having a thickness of 0.3 mm.

[0036]

Finally, by sputtering, an indium tin oxide (ITO) film 80 having a thickness of 100 nm is formed. The ITO film is a transparent conductive oxide and patterned to complete electrical connection between the electrical wirings and the semiconductor integrated circuit. (Fig. 5(D))

[0037]

In this way, the formation of the semiconductor integrated circuit on one substrate of the liquid crystal display device is completed. The liquid crystal display device is

completed by using the obtained substrate.

[0038]

[EMBODIMENT 2]

The embodiment shows a schematic process for producing a semiconductor integrated circuit on a stick crystal. The embodiment will be explained using Fig. 6.

[0039]

In Fig. 6A, a peeling layer 102 made of silicon is formed on a substrate 101, and then a driver circuit (a semiconductor integrated circuit) 100 having TFTs is formed on the peeling layer 102. These are formed by the same process as in Embodiment 1.

[0040]

A silicon oxide film is formed as a passivation film. In Fig. 6A, a condition that the peeling layer 102 is formed on the substrate 101, and the semiconductor integrated circuit 100 made of TFT is formed thereon, and two-layer silicon oxide films 103 and 104 are formed, is shown.

[0041]

In the embodiment, the two-layer silicon oxide films 103 and 104 are formed by plasma CVD. The first silicon oxide film 103 is formed by applying a relatively high power, and the second silicon oxide film 104 is formed by a relatively low power. A thickness of the first silicon oxide film 103 is 100 to 500 nm, and a thickness of the second silicon oxide film 104 is 500 to 1000 nm.

[0042]

After a resist 105 for patterning is formed, the substrate having a laminate is immersed in a 1/10 hydrofluoric acid solution to etch the silicon oxide films 103 and 104. At this time, an etching rate of the first silicon oxide film 103 formed by applying the relatively high power is lower than that of the second silicon oxide film 104 formed

by applying the relatively low power. As a result, the second silicon oxide film 104 is undercut greatly. (Fig. 6B)

[0043]

Finally, by peeling the resist, a semiconductor integrated circuit having a taper-shaped cross section is completed.

[0044]

In the embodiment, the two-layer silicon oxide films 103 and 104 for a passivation film are used. Three-layers or more may be used. Also, by changing a film formation condition successively, a film may be used so that an etching rate becomes larger in a direction from a lower layer to an upper layer. Further, a material such as silicon nitride having the same effect or a combination thereof can be used.

[0045]

In the embodiment, since periphery of end portions of the insulating film 70 covering the semiconductor integrated circuit 100 has a taper shape, disconnection of a formed wiring in a step portion can be prevented. Also, a product yield and reliability can be improved.

[0046]

[EFFECT OF THE INVENITON]

In the present invention, it is possible to use various variations with respect to a kind, a thickness and a size of a substrate in a display device. For example, as described in Embodiment 1, a extremely thin film-shaped liquid crystal display device can be obtained. In this case, the display device may be adhered along a curved surface. Also, since a limitation of a kind of a substrate is relaxed, a material having light weight and high shock resistance, such as a plastic substrate, can be used, thereby to improve portability.

[0047]

In particular, by forming periphery of end portions of an insulating film covering a semiconductor integrated circuit into a taper shape, a structure having no disconnection of a wiring in step portion can be formed at formation of wirings or after the formation. thus, reliability of a display device can be improved.

[0048]

Also, since an occupying area of a driver circuit is small, a degree of freedom in arrangement of one display device and another display device is increased. Typically, since a driver circuit can be arranged in an area (several mm in width) around a display surface, a display device itself is an extremely simple and fashionable product. Its application is extended to various fields.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 shows a cross section structure according to the present invention;

Fig. 2 shows an outline of a producing method of a display device according to the present invention;

Fig. 3 shows a cross section structure of an example of display device according to the present invention;

Fig. 4 shows an example of a producing process of a semiconductor integrated circuit used in the present invention;

Fig. 5 shows a process for adhering a semiconductor integrated circuit to a substrate of a display device;

Fig. 6 shows an example of a producing process of a semiconductor integrated circuit used in the present invention.

[DESCRIPTION OF MARKS]

1 . . .driver circuit portion of a liquid crystal display device

2 . . . matrix portion of a liquid crystal display device

3 . . . substrate of a liquid crystal display device

4 . . . wiring electrode

5 . . . resin

6 . . . semiconductor integrated circuit

7 . . . N-channel type TFT

8 . . . P-channel type TFT

9 . . . base film

10 . . . interlayer insulating film

11 . . . passivation film

21 . . . substrate for forming stick crystal

22 . . . semiconductor integrated circuit

23, 24 . . . stick crystal

25, 27 . . . substrate of liquid crystal display device

26, 28 . . . surface on which wiring pattern is formed

29, 30 . . . driver circuit transferred on a substrate of a liquid crystal display device

26 . . . reverse surface of a surface on which a wiring pattern is formed,

31 . . . electrode of a liquid crystal display device, 32 . . . resin,

33 . . . wiring electrode, 34. . . semiconductor integrated circuit, 35 . . . bump,

40 . . . substrate of liquid crystal display device,

50 . . . substrate for producing semiconductor integrated circuit,

51 . . . peeling layer, 53 . . . base film, 54 and 55 . . . silicon island,

56 . . . interlayer insulating film, 57 and 58 . . . gate electrode,

59 . . . N-type region, 60 . . . P-type region, 61 . . . gate insulating film,

62 to 64 . . . aluminum alloy electrode, 70 . . . passivation film, 71. . . adhesive

72 . . . transfer substrate, 75 . . . substrate of liquid crystal display device,

76 . . . resin, 80 . . . wiring electrode, 100 . . . driver circuit portion,

101 . . . substrate for forming semiconductor integrated circuit,

102 . . . peeling layer, 103 . . . first silicon oxide film,

104 . . . second silicon oxide film, and 105 . . . resist

[NAME OF DOCUMENT] ABSTRACT

[SUMMARY]

[PURPOSE]

Obtaining a liquid crystal optical display device of higher production yield and higher reliability.

[CONSTITUTION]

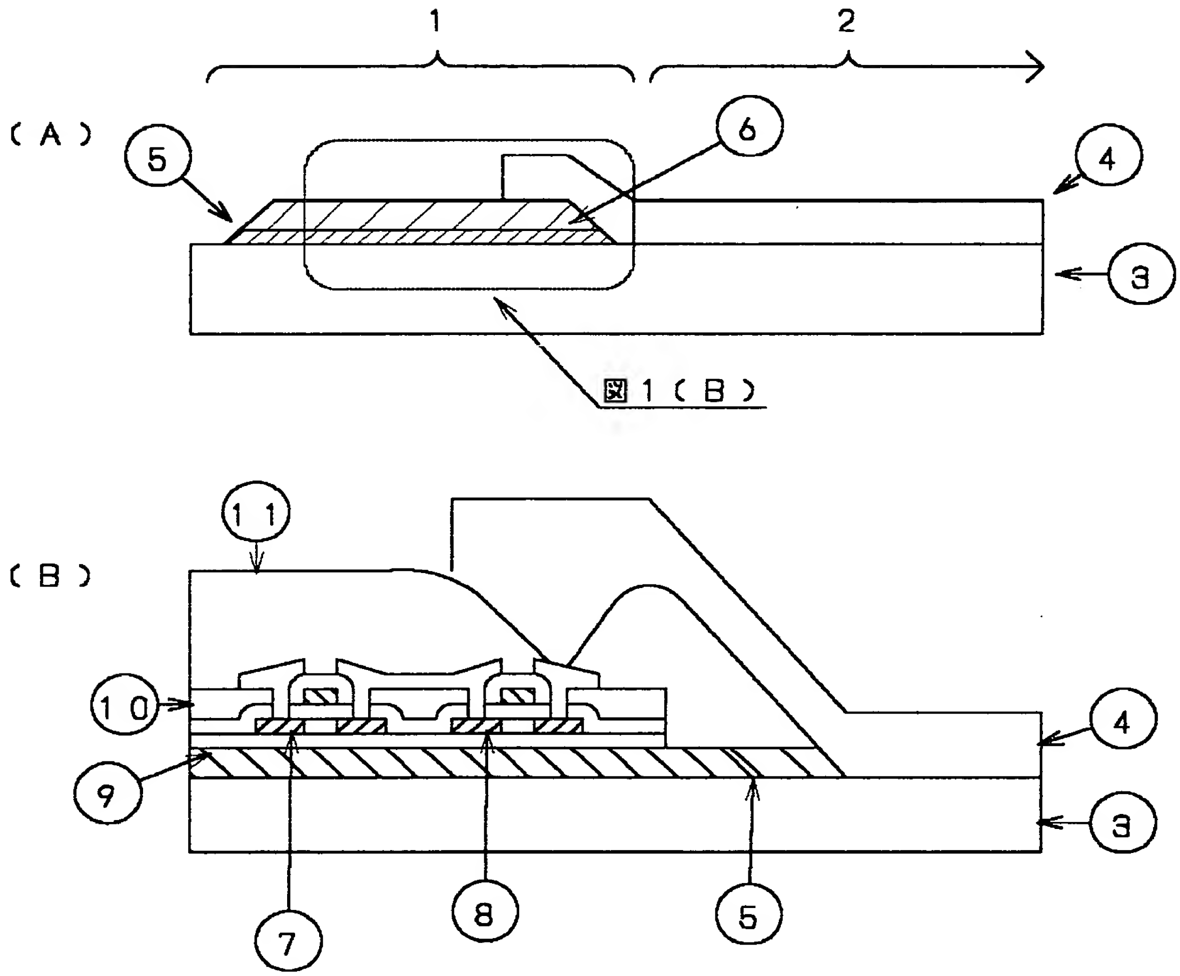
By making an edge portion of an insulating film 11 which covers an semiconductor integrated circuit made of TFTs 7 and 8 a taper-shape, it is possible to prevent a wiring 4 from disconnecting, and thereby it is possible to improve the production yield and the reliability of the device.

[SELECTED FIGURE] Fig. 1

【整理番号】

【書類名】　図面

【図１】



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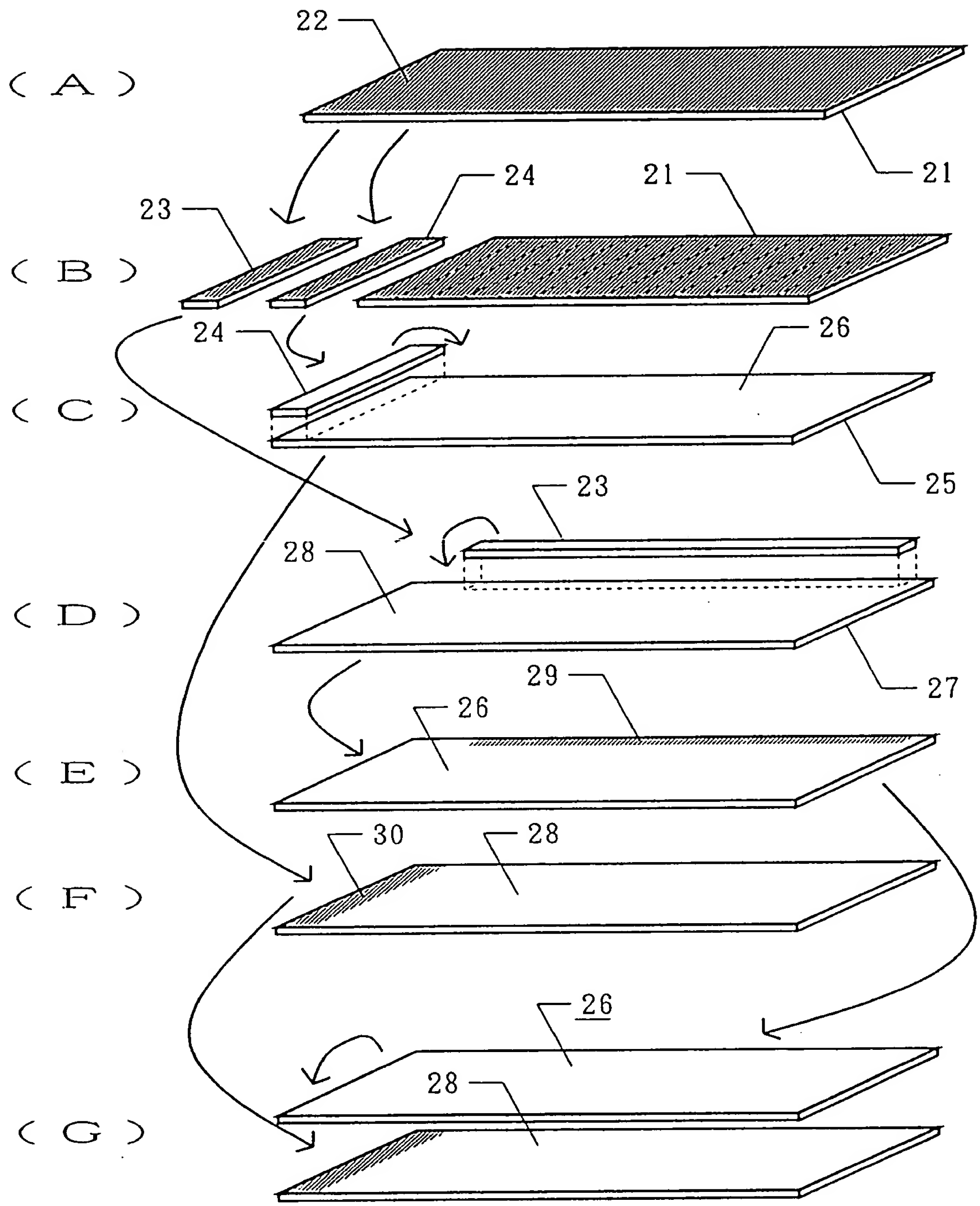
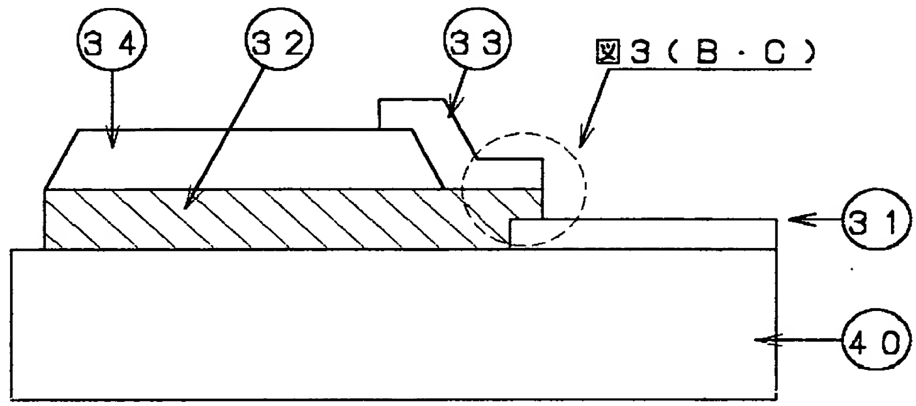
【図 2】



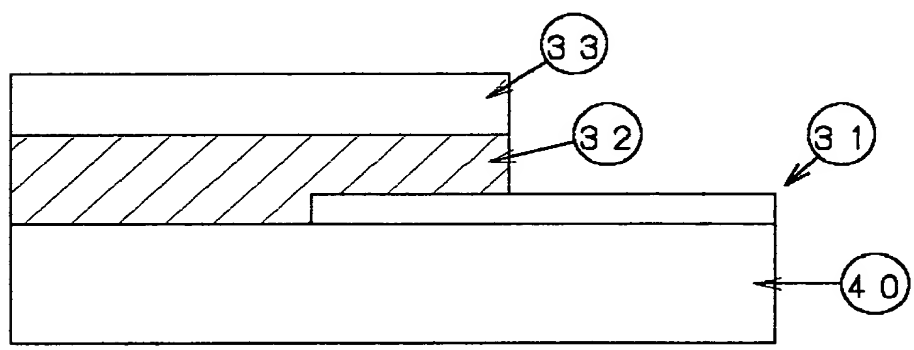
【整理番号】

【図３】

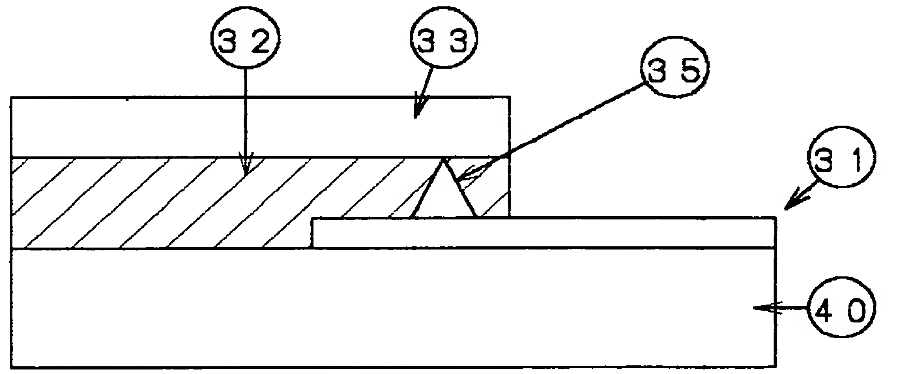
（Ａ）



（Ｂ）

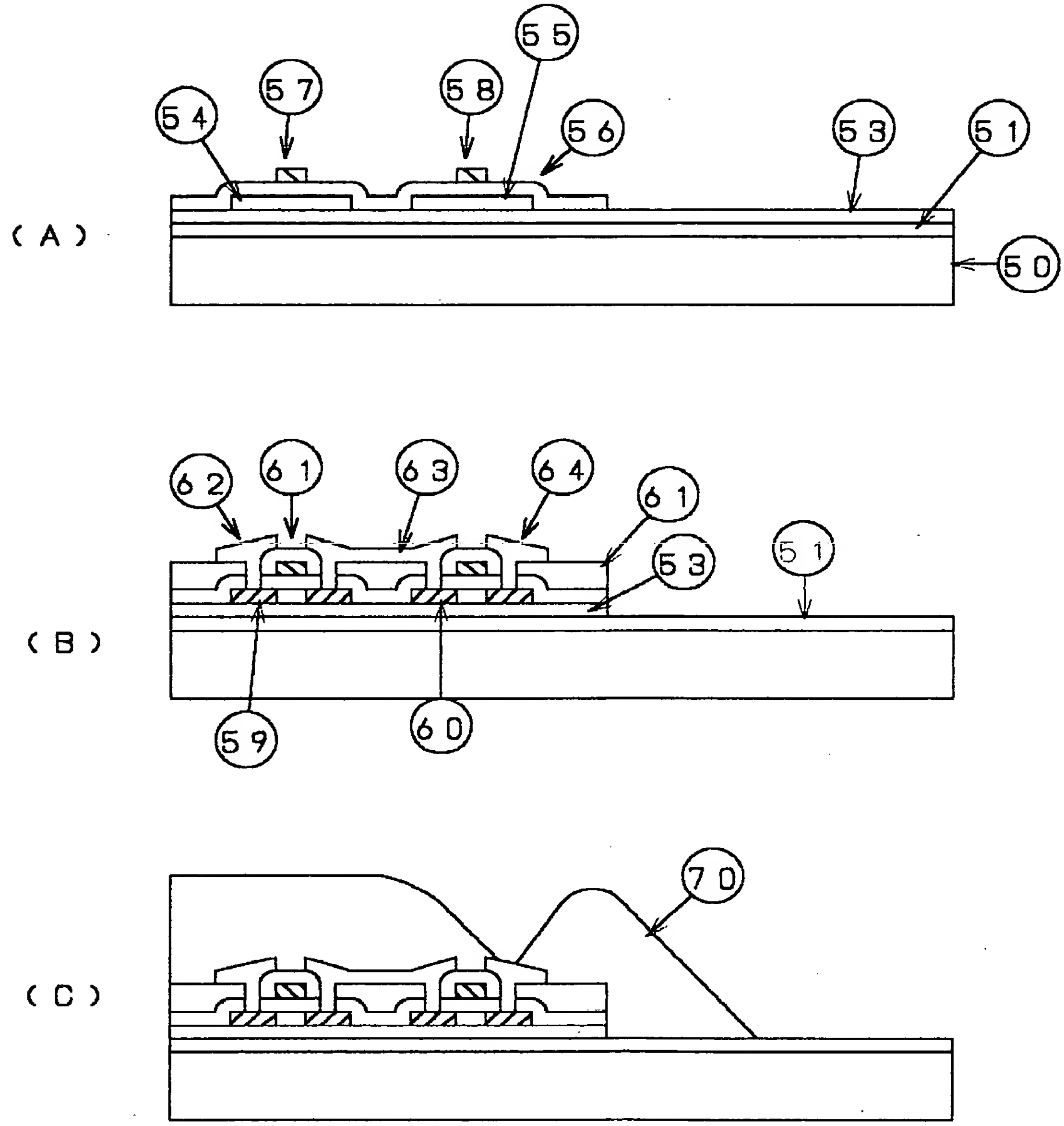


（Ｃ）



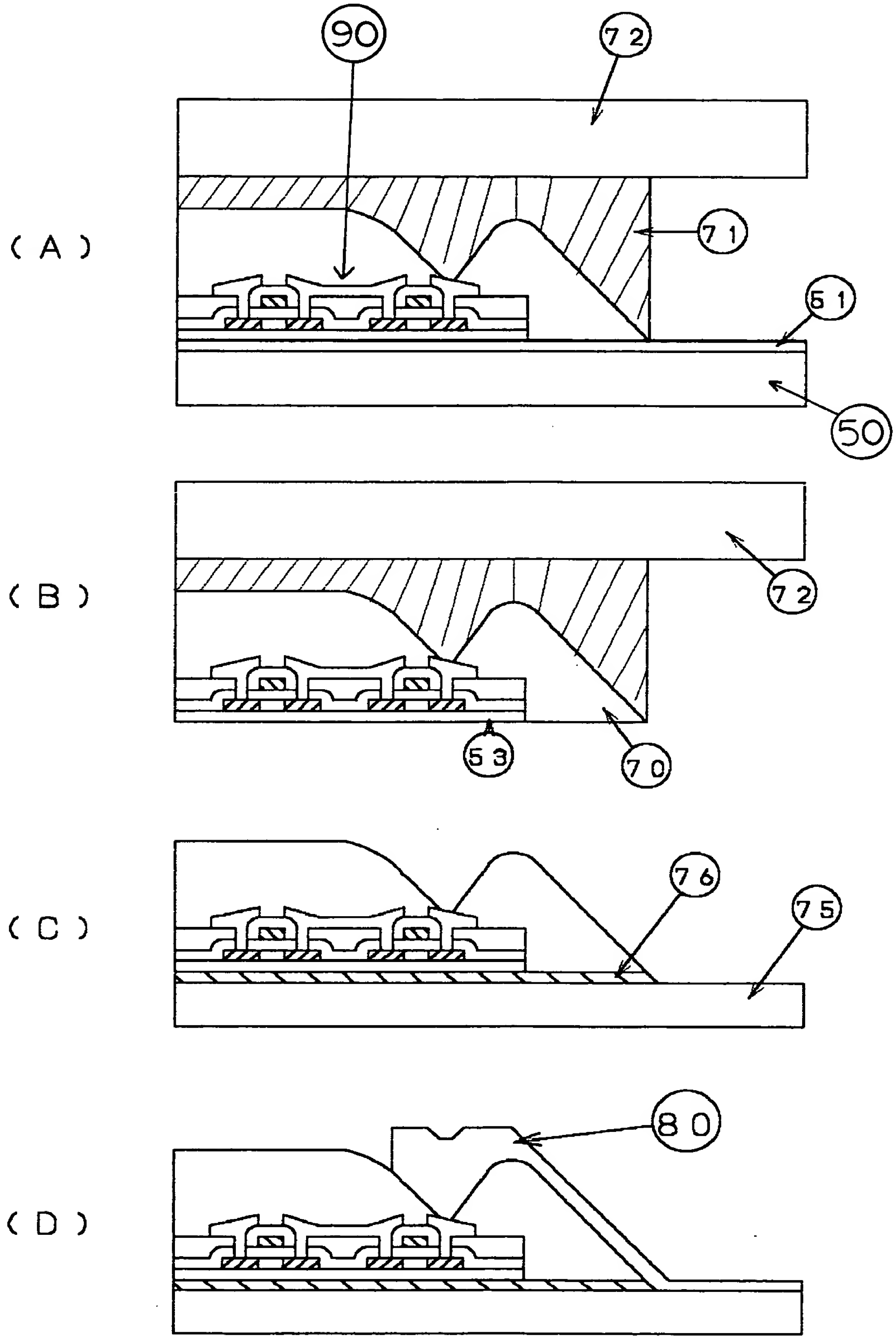
【整理番号】

【図4】



【整理番号】

【図５】



【整理番号】

【図6】